and deactivating the element **14** can continue for as long as desired. Alternatively, the system **10** may be configured to maintain mid-stroke positioning through mechanical means; for example, a ratchet (not shown) may be included to selectively return the load **12** to the first position, when the element **14** is deactivated. Moreover, and as shown in FIG. **1**, the protrusions P**1**-**3** and/or member **20** may be configured so as to present a tapered surface that promotes sliding disengagement only in one direction.

[0051] An opposite example is shown in FIG. **2**, wherein a portion of a load **12** is drivenly coupled to an active material element **14**, and caused to slidably engage an external member **20** defining a surface. The surface defines a plurality of mid-stroke detents or cavities (shown in FIG. **2** as three, C**1**-**3**) that mechanically resistively catch the load **12** as it slides by. When the load **12** translates across one of the cavities C**1**-**3**, the stress in the element **14** is increased, causing a rapid change in the electrical resistance of the element, and a corresponding mid-stroke position of the load **12** to be determined. It is appreciated that in operation, the system **10** may be calibrated by first activating the element **14** and translating the load **12** from first to second cavities C**1**-**3** to establish the relationship between the activation signal and the rate of change in electrical resistance. After the relationship is established, the strength or duration of the activation signal can be adjusted to increase or decrease the power usage, and/or compensate for environmental interference.

[0052] In a preferred embodiment, a second active material element **26** may be disposed within or incorporated so as to otherwise define the slidably engaged surface, such that the cavities C**1**-**3** are selectively variable (FIG. **2**). More particularly, the member **20** may be formed at least in part by the second active material element **26**, or include an overlay (not shown) consisting essentially of the element **26**, and the second element **26** enables the depth of one or more of the cavities C**1**-**3** to be selectively increased, decreased, or eliminated altogether. It is appreciated that any modification of the depth will vary the stress induced thereby, and therefore alter the rapid change in electrical resistance. More preferably, differing pluralities of cavities C**1**-**3** may be caused to disappear, when it is no longer desired to determine their corresponding mid-stroke positions, by utilizing and activating a second element **26** operable to recover a shape resultant in a flush surface with the member **20**. A suitable second active material **26** for the intended use is a shape memory polymer—an active material able to recover shape memory when in planar form. Alternatively, the modifiable cavities C**1**-**3** can also be achieved by using a magnetorheological and/or electrorheological fluid, or damper.

[0053] A preferred embodiment of the system **10** is shown in FIGS. **3***a* and **3***b*, wherein a portion of a load **12** is drivenly coupled with an active material element **14**, and the system **10** is configured to use magnetism to effect the change in stress and therefore electrical resistance. That is to say, the load is caused to engage a magnetic field at the mid-stroke position, which in turn, effects a force upon the element **14**. For example, a series of elongated magnets **30***a*-*c* may be off-centered along and orthogonally oriented relative to the path, so that they each exert an attractive magnetic force upon a ferrous part of the portion of the load **12** as it passes by. As such, the magnets **30***a*-*c* individually cause an increase in stress, e.g., further by causing the portion **12** to frictionally engage an external member **20**, and therefore a rapid change in electrical resistance within the element **14** (FIG. **3***a*).

[0054] In a further embodiment, and as shown in FIG. **3***b*, the load **12** may be connected to the first end of a fulcrum **28**, where packaging necessitates. It is appreciated that other simple machines, such as pulleys, friction wheels, and the like may be used in the system **10** to redirect the motion of the translation, increase the force or distance of the stroke, or otherwise mechanically amplify the stress. More particularly, the fulcrum **28** may be ferrous or present a magnet **30** at the end opposite the load **12**. The fixed member **20**, in this configuration, correspondingly presents magnetic or ferrous material based upon the fulcrum **28**. As the load **12** is caused to translate to the mid-stroke position it will reach a point wherein the field **30***d* acts upon the opposite material; at this point the element **14** experiences a spike or reduction in stress, and a rapid change in electrical resistance occurs. As the magnet **30** moves closer to the opposite material, the magnetic field **30***d* becomes stronger. It is appreciated that the magnet **30** may be configured such that the magnetic field either attracts, so as to reduce the tensile stress experienced by the element **14** by reducing the mechanical resistance to motion, and through reducing the tensile stress, reducing the electrical resistance in the actuator material, or repels, so as to induce a greater tensile stress and accordingly increase the electrical resistance in the element **14**. Again, the controller **24** detects the rapid change in electrical resistance caused by the magnet **30** and determines the mid-stroke position of the load **12** based thereupon.

[0055] It is further appreciated that either or both of the fulcrum **28** and member **20** may be magnetized, and/or present a paramagnet (i.e., a material that emits no magnetic field of its own but responds in the presence of a magnetic field), a ferromagnet (i.e., a material that responds in the presence of a magnetic field and emits its own magnetic field after the first field is removed), or a non-permanent magnet, such as an electromagnet. Where an electromagnet is utilized, the fulcrum **28** is preferably further coupled to a switch (not shown) and is configured to activate the electromagnet by toggling the switch, when at or near an upcoming mid-stroke position.

[0056] In the preferred embodiment of the system **10** shown in FIG. **4**, a portion of a load **12** is drivenly coupled with an active material element **14**, and oppositely to a spring **32**. Again, the element **14** is communicatively coupled with a controller **24** operable to measure the electrical resistance of the element **14** over time. The system **10** functions to selectively modify the damping coefficient of the spring **32** with respect to the driven load **12** by engaging a mechanical resistance mechanism (e.g., a mechanically resistive rotating wheel) **34** at the mid-stroke position. More preferably, each coil **32***a* of the spring **32** is caused to engage the mechanism **34**, so as to determine a plurality of mid-stroke positions. That is to say, each time a coil **32** engages the wheel **34**, a rapid change in both mechanical resistance to motion and in electrical resistance is produced, and a corresponding mid-stroke position is determined.

[0057] Alternatively, the spring **32** may be formed of the second active material element **26**, such as SMP, and communicatively coupled to an activation source (not shown); for example, as part of an ancillary circuit as further described below. The source is communicatively coupled to the load **12** and cooperatively configured therewith to deliver a signal to the spring **32**, when the load **12** is at the mid-stroke position. By activating the SMP spring **32**, the damping coefficient and therefore stress level within the element **14** is changed. Lastly,